

Focus on Research



NHDOT

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Spring Thaw Predictor & Development of Real-Time Spring Load Restrictions

In the fall of 2006 research was begun to develop a real-time Spring load restriction methodology for NHDOT. The methodology is intended to guide Maintenance Districts in their annual management of load restrictions by identifying the beginning and duration of the spring thaw period. The methodology will have statewide application. The expected result of the project is the ability to protect state and municipal highways from truck load damage, while minimizing the economic impacts of load restrictions on the trucking industry.

Two methods will be used to determine how long load restrictions are needed following the complete thaw of soils under a roadway; manual measurement and forecasting by computer model. Data will be obtained from five sections of state roadways and two maintenance shed sites. The

manual method includes the use of frost tubes to identify when spring thaw has begun. Strength measurements are made with a Benkelman Beam to identify when adequate strength has returned to the roadway base to allow the load restrictions to be lifted. The second method utilizes a forecasting computer model to determine the starting date and duration of load restrictions. The model will be developed based on field data from moisture sensors and the Benkelman Beam data, which will be used to establish a moisture-strength relationship to determine the duration of the load restriction. The data will be used to calibrate the model and optimize the match between the predicted and actual conditions. The completed model will be capable of showing the advancement of spring thaw across the State, based on a ten-day forecast.



Bob Eaton of Maintenance District 2 checks frost and ground-water depths in Rumney.

USGS Begins Study on Flood Flow Frequency of NH Streams

The Governor and Executive Council has approved a Joint Funding Agreement between the NHDOT and the NH/VT Water Science Center of the U.S. Geological Survey (USGS) to provide improved regional regression equations and an automated GIS-based tool for estimating flood flows at selected intervals at any stream

location in the State of New Hampshire. The system will be capable of estimating the magnitude of floods at 2, 5, 10, 25, 50, 100, and 500-year recurrence intervals and will develop the data necessary for the implementation of the point and click web tool *StreamStats* maintained by the USGS.

Since the development of the

last regression equations applicable to NH in 1978, nearly 30 years of additional peak flow data are now available. In addition, improvements in statistical techniques, quality & detail of datasets, and software for measuring an increased volume of basin characteristics provide additional incentives for

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Implementation Corner

Interactive Stormwater Table Brings Research to Life

Research has demonstrated the effects of pollutants on community stormwater drainage systems. An interactive stormwater table, constructed under the NHDOT research program and completed in 2006, provides a visual and educational approach to this issue.

At right, Ron Crickard from the Bureau of Environment helps students at the Heron Elementary school in Milford pour liquids, chocolate syrup and other materials on the table, only to watch as the

"pollutants" find their way through gravity and drainage structures to the water supply below. Milford is one of the EPA's National Pollutant Discharge Elimination System's regulated communities. As a regulated community, Milford and NHDOT are required to meet six minimum measures, one of which is public education and outreach.



Airport Preservation Study at Hampton Airfield

The airport system of New Hampshire includes 24 airports of both public and private ownership. The airports throughout the State provide the citizens of NH with a vital link to national and worldwide industries and economies. In addition to three commercial service airports, 21 general aviation airports offer economic benefits and services including on-demand charters, support for emergency medical services, disaster relief efforts, flight training, aerial photogra-

phy, and recreation.

NH airports are under continual threat from developers and other non-aviation pressures. The potential erosion of services described above requires that NHDOT assist small airport owners by providing tools and strategies to demonstrate the value of these assets to the citizens of NH.

A research study was initiated in 2006 to address these concerns and will utilize the Hampton Airfield as a case study and pilot project.

Through an agreement with Hoyle Tanner & Associates, lessons that can be applied to other airports will be identified and recommendations developed.



More New Research

Performance of Warm Mix Asphalt

Warm mix asphalt technology allows for the reduction of mixing and compaction temperatures, resulting in reduced emissions, energy costs, and aging of the binder. It may also allow for longer haul distances, cool weather paving, and act as a compaction aid for stiff mixtures.

Aspha-min® (zeolite), and Sasobit® are two technologies that will be studied. A zeolite test section has already been placed and a variety of samples

and cores are available for testing. Similar plans are underway for the Sasobit product.

The MMLS3 (Model Mobile Load Simulator) at UNH will be used to evaluate performance, both in the lab and at the test sections. Moisture sensitivity will also be tested by the MMLS3 and low temperature cracking susceptibility investigated in accordance with AASHTO T322.

Phase I of the project in-

cludes laboratory testing of the existing Aspha-min® plant mix specimens, cores and field sections as well as laboratory fabricated Sasobit® specimens. Phase II will include testing of the Sasobit® field section and cores.

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NHDOT RESEARCH
SECTION

NH-VT Automated Bridge Anti-Icing System Goes Online

The New Hampshire DOT and Vermont AOT are in the data-collection phase of a joint research project to evaluate the effectiveness of a fixed automatic spray technology (FAST) system. FAST systems combine pavement and weather sensors with spray nozzles in the roadway to preemptively apply anti-icing chemicals before dangerous conditions develop. Expected benefits include quicker response to slippery conditions, fewer maintenance crew dispatches, and reduced motor vehicle accidents.

The system was supplied

through a contract with Boschung America. Site work and hardware installation occurred during the 2006 construction season by NHDOT and VTrans forces on the southbound structure carrying Interstate I-89 over the Connecticut River between Lebanon, NH and White River Junction, VT.

A two-year evaluation is planned. Benefits will be measured by evaluating the costs of operation, personnel and equipment, and by evaluating system performance for prediction and treatment of icing conditions. An

assessment of the potential effects of potassium acetate chemical on the concrete structure is also planned. NHDOT is operating and maintaining the system.



Ongoing Research

Field Installation Updates



Alternative Pavements for Snowmobile Crossings

Two products installed at trail crossings in Errol, Groveton and Rumney in 2005 have now been exposed to two full winters of snowmobile traffic. Where paved approach aprons do not exist, severe edge wear and chipping were observed in both products as well as the control sections. A Gilsonite-modified pavement crossing installed in 2006 held up well after one year of exposure and will continue to be monitored.

The machine-applied thermoplastic product and

possibly the Gilsonite-modified pavement could hold promise as a maintenance treatment after initial wear of a conventional pavement has occurred. Such treatment is expected to be more durable than conventional pavement patches and could extend the life of the crossing until scheduled rehabilitation or overlay occurs.

“He who would have fruit must climb the tree.”



Preparation of Shoulder Rumble Strips before Overlayment

This research seeks to identify a cost effective and efficient method for treating rumble strips prior to overlay, along with a corresponding specification and guideline. Four preparation scenarios were selected and incorporated into 500-foot segments of northbound I-89 in Enfield prior to receiving a 1.5-inch overlay in July 2005.

The four test sections consist of A) shim and overlay, B) just overlay, C) mill, inlay and

overlay and D) mill and overlay. The rumbles reflected almost immediately through the overlay in Sections A and B. The two milled sections (C and D) did not. All have otherwise performed successfully through two winter seasons.

A statewide contract will re-mill the rumble strips during the 2007 season. Monitoring will continue to determine whether milling has an impact on the integrity of the overlay.

- Thomas Fuller

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the Department to complete this research.

The pool of available basin characteristics in the region is much larger due to continued implementation of GIS applications. An automated system for computing basin characteristics and solving the regression equations is expected to save engineers significant time when calculating needed stream flow statistics.

Pooled Fund Update

NHDOT Joins Traffic Control Device (TCD) Consortium

The Department recently joined the Traffic Control Device (TCD) Consortium, a pooled-fund study with 17 other states. The focus of the TCD Consortium is the systematic evaluation of novel traffic control devices, employing a process that addresses human factors and operations issues for new TCD ideas. Providing local and state agencies quicker response to their needs and quicker response to new technologies enables consistent TCD idea identification and evaluation.

TCD Consortium efforts will aid in the compliance with the FHWA Manual on Uniform Traffic Control Devices (MUTCD) rule-making process and incorporation of novel devices into the MUTCD. Issues addressed within the scope of the Consortium include alternatives for new symbols or messages for signs; automated flagger devices for work zones; alternative uses for in-roadway flashing lights; alternative colors for signs & markings for



transponder-controlled tollbooth lanes; potential new traffic signal displays or modifications (retroreflective backplate borders, etc.); alternatives for speed reduction markings (chevrons, dots, etc.), and roundabout supplemental signs.

(TPF-5(065))

Completed Research



NHDOT Conducts E-ZPass Purple Light Experiment

During the fall of 2006, the Department installed and experimented with purple lights and advance signage to

supplement existing traffic control associated with northbound and southbound E-ZPass movements along the I-93 approaches to the Hooksett Toll Plaza.

The purpose of the purple lights is to improve toll plaza operations and safety through the reduction in the number of conflicts created by last minute lane changes and weaving maneuvers taking place between the approach lanes and the toll booths. The Hooksett test site was selected because of the unique characteristics of the horizontal and vertical

geometrics along with visibility issues caused by frequent early morning fog.

While the purple lights showed improved toll booth operations at a statistically significant level during the two weeks in October that the lights were operational, the jury is still out as to whether this or other devices will ultimately be chosen to improve wayfinding and navigability through the tolls.



WHAT'S YOUR PROBLEM?